

NIGERIA'S ENERGY CHALLENGE AND POWER  
DEVELOPMENT: THE WAY FORWARD

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## NIGERIA'S ENERGY CHALLENGE AND POWER DEVELOPMENT: THE WAY FORWARD

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### ABSTRACT

The ever increasing demand and meager supply of energy in Nigeria has been a great challenge to her development. This situation is becoming critical, with increasing population not balanced by an adequate energy development programme. The incessant power generation failure has grossly affected the economy, seriously slowing down development in rural and sub-rural settlements, with present energy policy mainly benefiting urban dwellers. Globally, energy projections stipulate that between 2002 and 2025, global energy needs may rise by over 34%, with that of developing nations doubling this percentage. A robust solution must be found to end the nation's energy crises. This Viewpoint compares the energy potential of Nigeria with the challenges faced. Nigeria receives a huge amount of solar radiation, has abundant wind energy resources, and large deposits of fossil fuel, as well as enormous hydro-power resources from Niger and Benue Rivers. However, of these about 80% of hydro-power remains untapped, the total 5.5KW-hr/m<sup>2</sup>/day of solar radiation is not utilized and wind energy resources remain unexploited. The solution lies in creating a mixed supply of energy in which as yet untapped renewable resources are combined with abundant non-renewable fossil fuel, including the massive quantities of gas wasted from crude oil exploitation.

### INTRODUCTION

Energy has been described as a force multiplier that enhances man's ability to convert raw materials into useful products, providing varieties of useful services (Sorensen [1]). It is of different kinds and forms with broad division under the renewable and non-renewable energy sources (Harmann [2]). The non-renewable sources have been the most used and produce harmful emissions, thereby making it environmentally unfriendly. These sources also deplete and do not produce adequate and consistent power for national consumption, the cost of maintenance also is capital intensive. Moreover, the energy needs of the countries of the world are increasingly growing. An international projection reported that the energy dependence of the world is expected to rise by over 34% between 2002 and 2025, while that of developing nations only will

double the present demand (U.S department of Energy [3]). This development will bring about growing concerns in creating alternative energy sources which will be capable of meeting the energy needs of the world's population, as those of the present sources and usage is expensive, unsuitable and unsustainable.

### **THE NIGERIA ENERGY CHALLENGE**

Nigeria's energy need is on the increase, and her increasing population is not balanced by adequate energy development programme. The present urban-centered energy policy is deplorable, as cases of rural and sub-rural energy demand and supply do not reach the center stage of the country's energy development policy. People in rural areas depend on burning wood and traditional biomass for their energy needs, causing great deforestation, emitting greenhouse gases, and polluting the environment, thus, creating global warming and environmental concerns. The main concentration has been to supply energy to the cities and various places of industrialization, thereby creating an energy imbalance within the country's socio-economic and political landscape. The sole dependence on hydro-power sources for energy supply has also not been adequate, as this is controlled by factors such as the seasonality in the levels of water at the different hydro-power stations. The present and ever increasing population in comparison with the total capacity of available power stations means that Nigeria is not able to meet the energy need of the people. Rural dwellers still depend on charcoal and wood for cooking and heating, because they lack electric power.

### **ENERGY PROSPECT OF NIGERIA**

According to a recent report, only 20% of the nation's hydro-power potential is tapped for use, and the amount of solar radiation in the country is about 5.5KW-hr/m<sup>2</sup>-day (ECN-UNDP [4]), representing huge prospect for energy generation if a total capacity can be developed for that purpose. Despite this, infrastructure for energy supply has remained grossly inadequate, the country's four refineries produce about 30% of installed capacity of 445,000 bpd (ECN-UNDP [4]) with the present consumption buffered by imports, thus taking the energy supply situation of the nation tend towards crisis state.

However, the nation has been described as having capacity for wind energy utilization. Researchers have analyzed wind data from different stations within the country's five geo-political zones. Their outcome is that Nigeria has potential for wind power generation, with the potential rank in the order of north, central, south-east, south-south and south-west respectively (Adekoya and Adewale [5]; Fagbenle and Karayiannis [6]). Offshore areas of Lagos, Ondo, Delta, Rivers, Bayelsa and Akwa Ibom States also have potentials for harvesting strong wind energy throughout the year.

### **THE WAY FORWARD**

Nigeria should strive for a well rounded energy mix, combining the available renewable energy with the non-renewable fossil fuel. The gas being flared at the different crude oil refining sites could be used to generate abundant electric power for

the nation instead of being wasted with deleterious impact of burning on the environment. The government also needs to develop capacities and develop the infrastructure for harvesting wind for power generation from sites within regions having high wind capacity, trapping the abundant solar energy freely available in the nation, increase the capacities of the present hydro-power stations and also establish various power stations that will use the natural gas from crude oil exploitation to drive turbines for electricity generation. All the energy thus generated should be fed into the national grid, creating adequate mix of energy from the different sources and having a compact energy development process which will be suitable, sustainable, constantly available, environmentally friendly and economically viable in the long term national energy plan.

## REFERENCES

1. Sorensen, H.A. *Energy conversion systems*, Wiley, USA, 1983, 485-491.
2. Hermann, S. *A solar manifesto*, James and James LTD, London, 2001, 1-22.
3. U.S department of Energy. 2005. Energy information administration, international energy outlook 2005. Available on the web [[http://www.eia.doe.gov/oiaf/pdf/0484\(2005\).pdf](http://www.eia.doe.gov/oiaf/pdf/0484(2005).pdf)]
4. Energy Commission of Nigeria and United Nations Development Programme (ECN-UNDP). 2005. Renewable energy master plan: final draft report available on [<http://www.iceednigeria.org/REMP%20Final%20Report.pdf>, 17 June 2007]
5. Adekoya, L.O. and A.A. Adewale. Wind energy potential of Nigeria, *Renewable Energy*, 1992, 2(1), 35-39.
6. Fagbenle, R.O. and T.G. Karayiannis. On the wind energy resources of Nigeria, *International Journal of Energy Research*, 1994, 18 (5), 493-508.

